

METAL SUBSTRATE WITH BONDED ELASTOMERIC  
LAYER

Field of the Invention

The present invention relates to metal substrates and attached  
5 elastomeric layers and, more particularly, to glass guidance  
components for use in automotive vehicles, wherein the component  
includes a metal reinforcement with a thermosetting bonding veneer  
which is overlaid by a second thermosetting material. More  
specifically, the present invention encompasses a metal reinforcement  
10 having a peroxide cured thermoset bonding veneer bonded to the metal  
and a sulfur cured rubber overlying the bonding veneer.

Background of the Invention

Polymer coated metals are advantageously used in the  
automotive industry. Metal reinforcement in a seal provides rigidity  
15 for flush glazing systems. An elastomeric extrusion typically covers  
the metal to protect adjacent surfaces and the metal itself. The  
elastomeric extrusion preferably permits the resiliency and  
conformability of the metal reinforcement while enhancing resistance  
to the elements including extreme temperature fluctuations and  
20 providing an interface with a panel. The elastomeric extrusion needs a  
heat activated thermosetting adhesive to bond to the metal  
reinforcement.

Typically, the process of providing a metal strip with an EPDM  
coating begins at a coil coating facility where the metal is cleaned,  
25 dried and coated with a primer. Solvents of the primer are evaporated  
and the coated metal is baked to leave a layer of primer on the metal.  
An adhesive such as a heat activatable adhesive is then applied to the  
primer. The adhesive is best activated at time of vulcanization of the  
profile.

30 The use of adhesives and primers and their associated  
processing steps adds a significant cost factor to the end product.  
Alternatively, the application of the adhesive to the metal can be done  
in line during the extrusion process. Further, as each of these steps  
may encounter variances, there is the potential for increased scrap.  
35 That is, the additional coatings required to employ the adhesive,

introduce further variances in the process and may lower the effective manufacturing rate. Thermosetting heat activated adhesives tend to flake off at the roll forming station resulting in blisters.

Therefore, the need exists for a multi-layer component having an elastomeric material attached to a metal, wherein delamination is reduced. The need also exists for a seal having a metal bonded to an elastomeric material, wherein the need for adhesives and solvents during manufacturing is reduced. The need also remains for a glass guidance component having an EPDM sufficiently bonded relative to a metal carrier to preclude delamination during use, without requiring expensive adhesives or processing steps.

#### Summary of the Invention

The present invention provides a laminate having a metal layer integrally bonded to a peroxide cured rubber bonding veneer having a cross linked EPDM bonded to the bonding veneer.

In a particular configuration, the present invention provides a glass guidance component having a metal reinforcement, a peroxide cured rubber bonding veneer integrally bonded to and encapsulating the metal reinforcement and a cross linked EPDM bonded to the bonding veneer.

The present construction sufficiently adheres the bonding veneer to the metal reinforcement to substantially preclude a non-destructive separation. As the outer EPDM layer is generally compatible with the bonding veneer, the EPDM outer layer may be disposed on the bonding layer and cured in a traditional manner.

#### Brief Description of the Drawings

Figure 1 is a prospective view of an automobile showing location of the present invention.

Figure 2 is a cross sectional view of a glass guidance component.

#### Detailed Description of the Preferred Embodiment

Referring to Figure 1, the present invention includes a laminate or composite 10 which may be employed in a vehicle 12 as a glass guidance component or a sealing structure. The composite 10 can be

constructed to provide a contacting, guiding or sealing interface with a panel 14.

The panel 14 can be any of a variety of materials and does not limit the present invention. For example, the panel 14 may be glass, metal or a composite which is painted, surface treated or bare. In the operating environment, it is contemplated the panel 14 is repeatedly brought into and out of engagement with the composite 10. The engagement of the panel 14 and the composite 10 may result from motion of the panel relative to the composite, or alternatively motion of the composite relative to the panel.

For clarity in the description, the composite 10, will be described in terms of glass guidance component. Referring to Figure 2, the glass guidance component configuration of the present invention includes a reinforcement 20, a bonding veneer 30 bonded to at least a portion of the reinforcement and a feature layer 40 attached to the bonding veneer. Typically, the composite 10 has a given cross sectional profile and a length.

#### *Reinforcement*

The reinforcement 20 is preferably a metal such as aluminum, steel, stainless steel, galvanized steel or similar alloys. Generally, the reinforcement 20 functions as a carrier and extends the full length of the glass guidance component. The reinforcement 20 may be a stamped, molded, poured or extruded construction. The specific metal and thickness of the reinforcement 20 is at least partially determined by the intended use of the composite 10.

#### *Bonding Veneer*

The bonding veneer 30 is bonded to the reinforcement 20. Preferably, the bonding veneer 30 encapsulates the reinforcement 20 and has a sufficient thickness to preclude exposure of the reinforcement and thus provides a basis for the feature layer 40. The thickness of the bonding veneer 30 is as thin as possible to reduce material costs, however, the bonding veneer has a sufficient thickness to accommodate line processing variations and stretch bending so as to maintain an encapsulation of the reinforcement 20. It has been found a thickness range of 0.2 – 0.5 mm has been satisfactory with a typical thickness of 0.35 mm being sufficient for the bonding veneer 30.

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Preferably, the bonding veneer 30 includes at least one of a (meth)acrylate coagent or maleinized polybutadiene in a peroxide cured material. It has been found that this compound bonds directly to the metal reinforcement 20.

While the (meth)acrylate coagent and/or maleinized polybutadiene can be employed in sulfur cross-linkable rubber formulations in the bonding veneer 30, it has been found that a higher bond strength is obtained in a peroxide curable formulation. It is believed the peroxide generates free radicals and polymerizes the (meth)acrylate coagent and the maleinized polybutadiene to form a thermoset polymeric adhesive on the metal surface in situ. The strength of the adhesive free bond between the reinforcement 20 and the bonding veneer 30 has been found to be a rubber tear bond. That is, non-destructive separation of the bonding veneer 30 from the reinforcement 20 is precluded for the intended operating parameters of the composite.

Typically, the use of peroxide cured formulations in hot air curing, or media beds using hot air to cure, leads to an undesirable tacky surface. Therefore, the present invention employs the feature layer 40 on top of the bonding veneer 30, wherein the feature layer includes a conventional sulfur curable rubber extrusion compound, typically employed in conventional glass run channels. The feature layer 40 also serves to protect the bonding veneer 30 from oxidation.

The bonding veneer 30 includes a polybutadiene and preferably liquid vinyl 1,2 polybutadiene (such as Ricobond 1756) forming 80% to 10% of the elastomer portion; carbon black at for example 100 phr (parts per hundred rubber); an oil; a desiccant; and cross linking initiators such as dicumyl peroxide at a 70% concentration in a range of approximately 2 phr to 15 phr and preferably at 4 phr; Saret 633 in a range of approximately 2 phr to 20 phr, preferably at 15 phr; and Rhenogran (TAC, Tri Allyl Cynaurate) at 50% concentration in a range of 0 to 5 phr and preferably at 3 phr.

Typical polybutadienes include: trans-1,4 polybutadiene; isotactic 1,2 polybutadiene; syndiotactic 1,2 polybutadiene; maleated polybutadiene and vinyl 1,2 polybutadiene.

In addition, the bonding veneer 30 may include insulating fillers such as white fillers, of which an example is silane treated clay in a sufficient quantity to substantially preclude galvanic corrosion of the reinforcement. The insulating fillers act to inhibit electrical transmission through the bonding veneer 30. That is, the bonding veneer 30 insulates the reinforcement 20. Thus, the bonding veneer 30 may be constructed to serve the bonding function, or serve the bonding function as well as an insulating function.

A typical colored bonding veneer includes:

Constituent	Amount (phr)
Buna 2370	90
Ricobond® 1756	10
Burgess KE	100
PB 1100	6.5
CaO	20
Dicumyl Peroxide (70%)	4.3
Rhenogran (TAC) 50%	3
Saret 633	15
Akrosperse® E-6724	5

where Burgess KE is a calcined clay surface modified with an organofunctional silane, specifically vinyl silane.

As approximately 95% of the relevant industry is believed to employ hot airbed curing of similar extrudates, the use of the bonding veneer 30 which is covered by a traditional EPDM or EPM feature layer 40 allows compatibility with the vast majority of manufacturing facilities.

#### *Feature Layer*

The feature layer 40 is any cross-linkable elastomer such as typical EPDM or EPM. The feature layer 40 can be any ethylene-based polymer like polyolefin elastomers or any peroxide vulcanizable elastomers like SBR and NBR, as well as natural rubber.

A suitable feature layer 40 includes:

Constituent	Amount
Buna EP 2370 (85 phr)	20%-80%
Ethylene	40%-80%
ENB	0%-9.5%

*Manufacture*

In manufacture, the reinforcement 20 is formed and cleaned. The starting metal reinforcement 20 can be an aluminum strip or ribbon. It would also be possible to similarly roughen the aluminum substrate used in the above example, although a satisfactory product can be produced without the application of a roughener. A flame treatment is recommended to remove surface oils. The metal reinforcement 20 is then roll formed to a desired shape.

The reinforcement 20 and bonding veneer 30 are then passed through a die where the bonding veneer is passed from an extruder and deposited onto the reinforcement. Substantially simultaneously, or downstream, the feature layer 40 is extruded onto the exposed surface of the bonding veneer 30. Typically, the extruded rubber of the feature layer 40 is then passed through a hot airbed or other curing mediums to cure as known in the industry.

Therefore, the present invention provides a solventless and adhesive free bond between a metal reinforcement or core and a rubber layer, wherein the rubber layer readily bonds to alternative elastomeric materials.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures.